I claim:

1. An apparatus for cooling single and multiple high-flux and ultra-high-flux heat dissipating devices, comprising

a liquid coolant module having a base plate and a cover plate defining therebetween a liquid coolant chamber with a liquid coolant inlet port and a liquid coolant outlet port in fluid communication with the liquid coolant chamber;

at least one heat dissipating device mounted to the liquid coolant module;

a multi-level-cooling-enhancement stud mounted upon each heat dissipating device and disposed within the liquid coolant module; and

means for inducing phase change nucleate boiling of a subcooled liquid coolant within the liquid coolant module to enhance its cooling performance.

2. The apparatus of claim 1, wherein the multi-level cooling enhancement studs include a centimeter-scale cylindrical core and millimeter-scale fins having micro-scale surface textures.

3. The apparatus of claim 1 and further comprising means for reducing vapor buildup from the phase change nucleate boiling of a subcooled liquid coolant by condensing vapor bubbles from the phase change nucleate boiling before they coalesce into large vapor masses.

4. The apparatus of claim 1 wherein the multilevel cooling enhancement studs are disposed to be submerged within liquid coolant flowing through the liquid coolant chamber from the liquid coolant inlet port to the liquid coolant outlet port.

5. The apparatus of claim 4 and further comprising means to induce jet-impringement cross-flow of liquid coolant within the liquid coolant module against

surfaces of each of the multi-level-cooling-enhancement studs in closest proximity to the liquid coolant inlet port to thereby clear away from these surfaces vapor generated from phase change nucleate boiling.

6. The apparatus of claim 5 wherein the means to induce the jet-impingement cross-flow of the subcooled liquid coolant includes micro-enhanced or mini-channel liquid coolant flow passages within the liquid coolant module to direct liquid coolant flow to the multi-level-cooling-enhancement studs at a speed greater than the speed of the liquid coolant flowing through the liquid coolant inlet port.